Utility of EMG Logger in diagnose sleep bruxism

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Abstract

Background: Surface electromyographic (EMG) devices are becoming more and more popular to assess sleep bruxism. **Objectives:** To evaluate characteristics of sleep bruxism using EMG Logger. **Materials and Methods:** A convenient sample of the patients at Hue University of Medicine and Pharmacy Hospital who had clinical signs related to sleep bruxism was collected. The patients were asked for anamnesis, followed by clinical examination and then guided to attach EMG Logger device in 2 consecutive nights, recorded data were analyzed by a specialized software. **Results:** Severe sleep bruxism accounts for the highest rate of 67%, moderate level accounts for 33%, there is no mild level and no bruxism; 80% had tooth wear, buccal and tongue mucosa ridging were 83.3% and 93.3%, respectively, there is no difference between the level of sleep bruxism and clinical signs ($p > 0.05$); 82.9% were phasic and mixed episode, 17.1% were tonic episode. **Conclusions:** EMG Logger supports diagnose and provide detailly about specifications of sleep bruxism.

Key words: *Sleep bruxism, EMG Logger, surface electromyographic device.*

1. BACKGROUND AND OBJECTIVES

Bruxism is a repetitive jaw-muscle activity characterized by clenching or grinding of the teeth and/or by bracing or thrusting of the mandible [1]. The disorder can occur during sleep or wakefulness with an estimated prevalence in the general adult population of approximately 8% [2]. Bruxism is divided into two distinct types based on the biological state in which the activity occurs, including: awake bruxism and sleep bruxism [3]. Awake bruxism (AB) is a masticatory muscle activity during wakefulness that is characterised by repetitive or sustained tooth contact and/or by bracing or thrusting of the mandible and is not a movement disorder in otherwise healthy individuals [3]. Sleep bruxism (SB) is a masticatory muscle activity during sleep that is characterised as rhythmic (phasic) or non-rhythmic (tonic) and is not a movement disorder or a sleep disorder in other- wise healthy individuals [3].

Currently, the gold standard for assessment of SB is Polysomnography with simultaneous audio-visual recording (PSG-AV). However, Polysomnography is often used for research purposes, but it is difficult to perform routinely in clinical practice to diagnose bruxism due to the complex procedure, high cost and relative inconvenience for the patient [4, 5]. Clinical reality, assessment of sleep bruxism based on clinical findings such as tooth wear and history of bruxism noise during sleep [6]. However, assessment of bruxism noise is not truly objective and diagnosis of sleep bruxism based on clinical findings such as tooth wear is not sufficient.

Some new methods such as electromyography give an overall, detailed, and reliable view of bruxism. A portable electromyography device was used to record masticatory muscle activity during sleep. In 2017, Yamaguchi T. introduced a micro electromyography device (FLA-500-SD), which can record masseter muscle surface electromyography clearly and accurately [5].

Within the scope of our research, currently in Vietnam, there is no surface electromyographic (EMG) device used to diagnose SB. Although the device is ultraminiature and wearable, it can record a precise and clear masseteric surface electromyogram. In addition, patients can attach the device and operate it by themselves in daily life [5]. Morever, When the cut-off value in EMG-episodes/h was 5.5/h for sleep bruxers, both sensitivity and specificity were 100% [4]. Therefore, to diagnose the patient's SB, we used the EMG Logger, a surface electromyography device, and translated documents related to its use, including: EMG Logger user manual, the note recorded during wearing the device and answer sheet for diagnostic results.

Introduce EMG Logger

The development of small integrated circuits and small lithium batteries due to technological advancements has enabled miniature electromyogram devices (EMG) to be manufactured, in cooperation with Harada Electronic Industry Ltd., Japan have developed an ultraminiature telemetric-type bruxism measurement system, in which electrodes and an amplifier are directly connected.

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In addition, the telemetric system needed a receiver unit, which was inconvenient to wear or carry during the day. We therefore developed a data-logger-type EMG measurement system with built in electrodes and memory [5].

Structure of the device

FLA contains electrodes, an amplifier, 12-bit analog-to-digital converter at a sampling frequency of 1 kHz, 16-bit CPU, a 3.7-V coin-shaped lithium battery, and a micro SD card. The size of FLA is 37.0 x 23.5 x 8.6 mm, and its weight is 6g (9g with a battery inserted) (Figs.1). The surface sizes of the bipolar measuring electrodes are 6 mm in diameter, and the distance between the centers of the electrodes is 24 mm. A reference electrode with the same size as that of the electrodes is positioned at the middle position between the two measuring electrodes. Gain of the amplifier is 256 times [5].

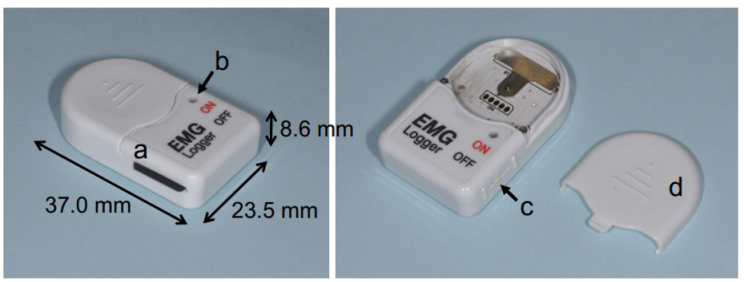

Fig. 1. Structure of FLA-500-SD [5].
a. Slot for micro-SD card b. LED lamp
c. power on/off switch d. cover of battery storage space

EMG can diagnose masticatory muscle activities including AB and SB. However, assessment of SB by using only an EMG has the possible disadvantage of not being able to discriminate SB from activities during the wake period after sleep onset (WASO) and orofacial activities, such as activities when awake during sleeping and swallowing and activities of talking during sleep. Therefore, burst scores detected by means of a single channel EMG tend to include activities during WASO and orofacial activities other than SB and to be overestimated [4].

2. STUDY SUBJECTS AND METHODS

2.1. Study subjects

2.1.1. Study subjects and location

This study was conducted among patients examined at Dental Clinic, the Hospital of Hue University of Medicine and Pharmacy from 02/2022 to 08/2023.

2.1.2. Inclusion criteria (1) willing to participate in the study, (2) more than 18 years old, to diagnosed sleep bruxism by EMG Logger.

2.1.3. Exclusion criteria (1) patients under a stage of orthodontic treatment, (2) under bruxism treatment, (3) use drugs that weaken neuromuscular activity, (4) under treatment of severe acute illness, have symptoms of toothache caused by dental pulp and periapical tissues diseases, and periodontal diseases, (5) use drugs for pain relievers, anti-anxiety, anti-depressants and psychotropic, (6) failure to follow instructions for wearing the device.

2.2. Study methods

2.2.1. Study designs Cross sectional study.

2.2.2. Sample method Convenient sample.

2.2.3. Sample size **n =30** SB patiens determined by EMG Logger device.

2.2.4. Study medias

- Examination instruments include: Basic examination kit, questionnaire for patient, check sheet for clinical features for doctor.

- Masseter muscle electromyograms EMG Logger: FLA-500-SD (FLA, Furusawa Lab Appliance Co., Ltd. Japan). The FLA contains electrodes, an amplifier, analog-to-digital converter at a sampling frequency of 1 kHz, CPU, a coin-shaped lithium battery, and a micro-SD card.

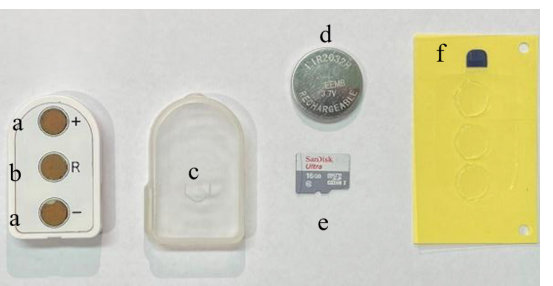

Fig. 2. Structure of FLA-500-SD
a. Measuring electrode b. Reference electrode
c. Protective cap d. Coin-shaped lithium battery
e. Micro-SD card f. Double-sided tape

2.2.5. Research objectives and assessment methods

2.2.5.1. Clinical signs

Doctors clinically examine patients to look for signs of:

- *Tooth wear:* Tooth wear caused by bruxism is usually attrition, caused by direct friction between two tooth surfaces during movement with flat, shiny, clearly limited and symmetrical surface characteristics. lock-key form. In addition, tooth wear due to bruxism can cause cervical tooth defects due to trauma from occlusion.

Classification of tooth wear according to Smith and Knight (Tooth wear index–TWI) from 0 - 4 level [7].

Record yes or no:

+ Yes: has at least one tooth with level 2 or higher wear (ie pathological wear, wear into the dentin layer, secondary dentin exposure or pulp exposure) [8].

+ No: have teeth with no wear (level 0) or physiological tooth wear, slight wear in the enamel layer (level 1) [8].

- *Pain/fatigue muscle* is a condition of pain/fatigue on one/both sides of the masseter or temporal muscle after waking up in the morning, record yes or no.

- *Buccal mucosa ridging (BMR)* is a thick white line on the buccal mucosa at the level of the occlusal plane.

Classification BMR according to Morita 2018 into 3 types [9]:

+ M0: none indicated the absence of BMR.

+ M1: one side indicate the presence of BMR.

+ M2: both sides indicate the presence of BMR.

Record yes or no:

+ Yes BMR: classification M1, M2.

+ No BMR: classification M0.

- *Tongue mucosa ridging TMR* is a thick white line on the tongue mucosa at the level of the occlusal plane, record yes or no.

Classification TMR according to Tomooka 2017 into 5 types [10]:

+ L0: None (no scalloping of tongue)

+ L1: Mild (shallow scalloping to whole or part of the lateral borders of the tongue).

+ L2: Moderate (deep scalloping to part of the lateral borders of the tongue).

+ L3: Severe (deep scalloping to whole of the lateral borders of the tongue).

Record yes or no:

+ Yes TMR: classification L1, L2, L3.

+ No TMR: classification L0.

2.2.5.2. Evaluation method of surface electromyogram EMG Logger in the diagnosis sleep bruxism

- *Measuring procedure*

+ *Preparation for recording*

After charging, a lithium battery is inserted into the body of FLA. A micro SD card is inserted into a slot in the body of FLA. The switch of FLA is turned on and blinking of a small LED lamp indicates the start of recording.

+ Attaching FLA

The skin surface is cleaned with alcohol gauze, and then the device is attached to the skin surface with dedicated double-sided adhesive tape (Fig. 3A). During nocturnal use, stronger fixation by adhesive tape over the body of device is recommended. If patients need some camouflage for daytime use, the device can be covered with gauze as if it is covering a wound on the face (Fig. 3B).

+ Recording data

Prior to recording data during the targeted period, recording data during some calibration movements such as maximum clenching, tapping, swallowing and coughing is performed. Then patients start their usual daily lifetime activity without restraint. The device should be removed before faces washing and taking a bath. When the recording has finished, the device is removed and the power switch is turned off. The micro-SD card is transferred from the body of FLA to a personal computer.

A B

Fig. 3. FLA-500-SD attached to the skin surface with double-sided adhesive tape (A) and covered with a piece of gauze for camouflage (B) [5].

- *Evaluate EMG results*

+ Select EMG burst

EMG data (recorded on the second and third days of wearing the device) were analyzed. By means of dedicated software, EMG signals were high pass filtered at 20 Hz, converted to absolute values, and smoothed by a width of 101 points (0.1 s). EMG bursts of more than two times the baseline amplitude with a duration of 0.08 s or more and with an interval of 0.08 s or more to the adjacent burst were selected.

Bursts are divided into two types:

* Phasic burst : Bursts have durations from 0.25 - 2 seconds.

* Tonic burst : Bursts have duration > 2 seconds.

+ Select EMG episode: include 3 types:

* Phasic episode : have 3 or more phasic bursts.

* Tonic episode : have 1 or more tonic bursts.

* Mixed episode : both phasic and tonic bursts.

+ % MVC: Percentage of bite force when SB compared to MVC (maximum voluntary contraction, i.e., maximum voluntary clenching).

+ Bruxism index: episodes/h.

+ Average bruxism index: Average bruxism index after 2 nights.

+ Average time episode: Average duration of episodes.

+ Sleep bruxism levels (measured with an EMG Logger) [4]:

0 (episode/ h < 4.0) : No SB

1 (4.0 ≤ episode/h < 5.5) : SB level mild

2 (5.5 ≤ episode/h < 7.6) : SB level moderate

3 (episode/h ≥ 7.6) : SB level severe

+ Diagnosis of sleep bruxism according to EMG Logger:

The research team chose a cut-off point of 5.5 episodes/hour to diagnose whether or not have SB [4], [11].

- *Yes SB*: episodes/h ≥ 5.5
- *No SB*: episodes/h < 5.5

2.2.6. Summary of research steps

- Receiving subjects coming for examination at the Dental Clinic of Hue University of Medicine and Pharmacy Hospital for SB reasons, meeting the general sampling standards.

- Ask about the subject's history of SB and the self-report or complaints of the sleep partner.

- Subjects wear the EMG Logger to confirm the diagnosis of SB for 2 consecutive nights.

- Collect the EMG Logger and take data.

- Enter, process and analyze data, select 30 subjects that meet SB diagnostic criteria using the EMG Logger (episodes/h ≥ 5.5).

- Return results to subjects and perform clinical examination on SB characteristics.

2.2.7. Data processing methods

The collected information and data were analyzed and processed by statistical method using SPSS software version 20.0 with p value < 0.05 with statistical significance.

- Describe data by number (n), percentage (%), average (mean), standard deviation (std), minimum value (min) and maximum value (max).

- Check the normal distribution of variables by testing *Kolmogorov - Smirnov.*

- Compare ratios and relationships between variables using tests χ^2 and *Fisher's.*

- Independent - Samples t test to evaluate whether the difference between 2 mean values is significant or not.

2.3. Research ethics

- The study was approved by the Ethics Council for Biomedical Research of the University of Medicine and Pharmacy, Hue University.

- The research requires the consent of the subjects after clearly explaining the purpose and meaning of the research. The subjects will remain anonymous throughout the research process.

- Subjects with SB condition who need treatment will be consulted and treated when agreed between the doctor and the subject.

3. RESULTS

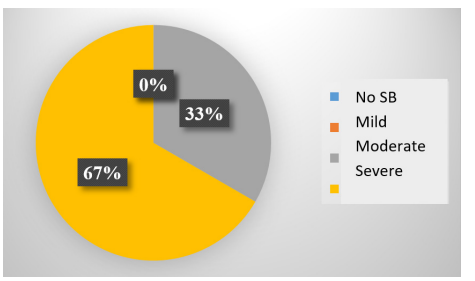

Fig. 4. Percentage distribution of sleep bruxism levels according to EMG Logger.

When measured by EMG Logger, the highest proportion of SB severe accounts for 67%, moderate level accounts for 33%, there is no SB mild and no SB at all.

Table 1. Distribution and bruxism index in males and females at each SB level

	Quantity n (%)		Episodes/h	
SB levels	**Male**	**Female**	**Male**	**Female**
Moderate	5 (45.5)	5 (26.3)	6.72 ± 0.37	6.32 ± 0.58
Severe	6 (54.5)	14 (73.7)	13.51 ± 3.84	10.47 ± 1.58
Total	**11 (100)**	**19 (100)**	**10.42 ± 4.47**	**9.38 ± 2.32**
p	0.425[a]		0.403[b]	

(a) Fisher's Exact test, (b) Independent-Samples T test.

Both genders have a higher proportion of SB severe than moderate level, with no SB mild and absence of SB. The average SB index in males and females are 10.42 ± 4.47 and 9.38 ± 2.32, respectively. The differences in the distribution and SB index between genders are not statistically significant (p > 0.05).

Table 2. Distribution among different levels of SB and awareness of patient or sleep partner.

SB levels (EMG Logger)	Self-report n (%)	Sleep partner's report n (%)	p*	Total N (%)
Moderate	1 (14.3)	9 (39.1)	< 0.001	10 (33.3)
Severe	6 (85.7)	14 (60.9)		20 (66.7)
Total	7 (100)	23 (100)		30 (100)

(*) Fisher's Exact test.

The number of subjects with severe bruxism index is higher than the moderate level. There is a significant difference in the levels of bruxism index and the awareness of patients or bed partners (p < 0.001).

Table 3. Number and percentage distribution of clinical signs.

Clinical signs	Quantity n=30	Ratio %
Tooth wear	24	80.0
Buccal mucosa ridging	25	83.3
Tongue mucosa ridging	28	93.3

Among the study subjects, 80% have tooth erosion, 83.3% have buccal mucosa ridging, and 93.3% have tongue mucosa ridging.

Table 4. Relationship between levels of SB and some clinical signs.

SB levels	Tooth wear levels			Buccal mucosa ridging (BMR)			Tongue mucosa ridging (TMR)				Total N
	Level 0	Level 1	Level 2	M0	M1	M2	L0	L1	L2	L3	
Moderate	2	8	0	2	1	7	0	3	2	5	10
Severe	6	12	2	3	2	15	2	4	11	3	20
Total	8	20	2	5	3	22	2	7	13	8	30
p*	0.567			1.000			0.108				

(*) Fisher's Exact test.

Tooth wear level 1, buccal mucosa ridging and tongue mucosa ridging at moderate level account for the highest proportion, there is no statistically significant difference in the levels of tooth wear, buccal mucosa ridging and tongue mucosa ridging (p > 0.05).

Table 5. Quantity and correlation between each type of SB episodes and SB index.

Episode types	Quantity		Correlation	
	Episodes	Ratio (%)	r*	p
Phasic	17.07	27.33	0.51	0.004
Tonic	10.68	17.10	0.62	< 0.001

Mixed	34.72	55.58	0.74	< 0.001
Total	62.47	100	0.86	< 0.001

(*) Pearson correlation.

Have 82.9% are phasic and mixed episodes, while only 17.1% are tonic episodes. There is a significant positive correlation between the SB index and the total episodes as well as each phasic, tonic, mixed episodes ($p < 0.05$), with correlations ranging from moderate to strong ($r > 0.3$).

Table 6. Average and maximum MVC percentage after 2 nights.

% MVC after 2 nights / Mean ± Std (%)	Mean (%)	Max (%)
	21.02 ± 13.86	137.69 ± 69.06

The average and maximum % MVC of the study subjects are 21.02 ± 13.86 and 137.69 ± 69.06 respectively.

4. DISCUSSION

This study introduces a newly developed wearable micro-electromyography system that is useful for analyzing masseter muscle activity at night in Vietnam. Although this device is ultra-small and wearable, it can record masseter muscle surface electromyography clearly and accurately. The purpose of this study is to examine the characteristics and severity of sleep bruxism in 30 SB subjects using a surface electromyography device - EMG Logger.

According to Fig. 4, when measured by EMG Logger, severe level accounts for the highest rate of 67%, moderate level accounts for 33%, no mild level and no SB. Thus, all subjects met the requirement to have SB according to the EMG Logger results with SB index ≥ 5.5 episodes/hour (moderate and severe level of SB). However, the EMG Logger only records masticatory muscle activity, there are no video recordings and other electrodes such as EEG, ECG, so it is difficult to distinguish whether the muscle activity is due to bruxism or other rhythmic masticatory muscle activity (RMMA).

As shown in table 1, both genders have a higher proportion of severe SB compared to the moderate level; the average bruxism index for males and females is 10.42 ± 4.47 and 9.38 ± 2.32, respectively, and the difference in the distribution and bruxism index between genders is not statistically significant ($p > 0.05$). This indicates that not only is there no difference in the distribution of bruxism rates between the two genders, but there is also no significant difference in the severity of bruxism between males and females. This result is consistent with previous studies by Saczuk (2019) which found no gender differences in the prevalence of sleep bruxism [12].

In table 2, the number of subjects with severe SB is higher than those with moderate SB level. There is a significant difference in the levels of bruxism and the awareness of patients or bed partners ($p < 0.001$). Patients often complain of their bruxism during sleep by recognizing themselves in a state of shallow sleep feeling a tight clenching of their jaws or grinding their teeth, and the grinding noise is often more frequently reported by bed partners, whose reports are usually more objective. According to Palinkas (2015), the sensitivity and specificity of grinding noise compared to polysomnography are 49% and 80%, respectively [13].

According to table 3. 80% of the research subjects have tooth wear. The most common tool used in evaluating the SB's clinical signs are tooth wear index (TWI) [6]. Some studies suggest that tooth wear can be reliably used to distinguish between SB and no SB [14]. However, these studies are based solely on patient's self-reports. In studies using laboratory methods on sleep (such as polysomnography PSG), most agree with our study that tooth wear is not a suitable tool for detecting SB [13]. When compared to the results of Tran Tan Tai's study on 298 patients aged 18 and older presenting at the Hue University of Medicine and Pharmacy Hospital (11/2016-04/2017), the overall rate of tooth wear was 67.1% [15]. Khalifa's study in 2020 found tooth wear rates of 77% in those under 25 years old and 81.1% in 26 - 30 year-olds, lower than our study results [8]. Compared to Le Nguyen Lam's study in 2023 on 258 dental students (18 - 25 years old) at Can Tho University of Medicine and Pharmacy, which reported a tooth wear rate of 98.1%, meaning almost all research subjects had at least one tooth wore at the dentin level (from level 2 upwards), higher than our results [16]. All studies show a very high rate of tooth wear in the general community. In Ohlmann's study in 2022, the accuracy of tooth wear as a sign was 51%. The specificity of this sign (87.2%) was much higher than the sensitivity (18.9%) [17]. According to Palinkas' study in 2015, the specificity of

tooth wear as compared to the gold standard PSG in diagnosing SB was 82% and sensitivity was 33% [13]. This means that the absence of tooth wear helps to exclude patients with SB rather than diagnose SB [13]. Tooth wear is considered the result of a multifactorial process related to the tooth surface wear, such as diet, gastroesophageal reflux, alcohol consumption and/or acidic beverages or medication [18]. Tooth wear is an accumulated abrasion from the past and cannot provide an accurate diagnosis of whether current SB is in a progressive stage or not [11]. According to Ohlmann's study in 2022, tooth wear is an irreversible condition and cannot determine whether tooth wear is part of an ongoing process or a consequence of preceding events [17].

According to Table 3, among the study subjects, 83.3% have buccal mucosa ridging, and 93.3% have tongue mucosa ridging. In Piquero's study in 1999, the prevalence of buccal mucosa ridging was 61.5% in 244 patients aged 20 - 59, lower than our study [19]. The presence of buccal mucosa ridging was not associated with bruxism or clenching of teeth, similar to the group's research results [19]. Takagi's study in 2003 also found that when analyzing electromyograms on subjects with buccal mucosa ridging, bruxism was not found, even when subjects performed a maximum voluntary clenching or light tapping, the presence of buccal mucosa ridging was observed similarly to when the jaw muscles were relaxed [20]. These results contrast with previous clinical reports that suggested buccal mucosa ridging was a result of bruxism activities [25, 26]. As for tongue mucosa ridging compared to Piquero's study in 1999, the prevalence of tongue mucosa ridging was 51.2% [19]. Similar to buccal mucosa ridging, the highest percentage was in the 20-29 age group, and the presence of tongue mucosa ridging was not associated with grinding or clenching of teeth [19].

According to Table 4, level 1 tooth wear, bilateral BMR and moderate TMR account for the highest proportion, the differences in tooth wear levels, BMR and TMR are not statistically significant ($p > 0.05$). According to Ohlmann B. (2022), clinical signs including tooth wear, BMR and TMR are appropriate evaluation tools at a moderate level to differentiate individuals with SB from those who are not affected [17]. Clinical signs such as BMR and TMR may be signs of bruxism during wakefulness or sleep and/or other normal oral activities (e.g., swallowing...). It has been demonstrated that bruxism during sleep and wakefulness are not independent conditions but interactively complementary to each other [21]. However, this study only investigates sleep bruxism, not evaluating awake bruxism.

Additionally, purposeless swallowing - not aimed to deliver food to the esophagus - performed throughout the day, by the repetition of this activity the pressure exerted on the buccal surface of teeth during swallowing might be a factor associated with the formation of buccal mucosa ridging [20]. Thus, the relationship between buccal and lingual mucosa ridging and SB status remains controversial.

When surveying the ratio of SB episodes in the study subjects (Table 5), 82.9% are phasic and mixed, while only 17.1% are tonic episodes. This result is similar as Lavigne (2003), over 88% SB episodes, based on electromyography (EMG) recordings, are phasic or mixed episodes [22]. According to Kato (2003), this ratio is approximately 90% [23]. According to Kato (2006), about 80% of bursts last less than 2 seconds (phasic burst).

According to the results in table 5**,** there is a significant positive correlation between the SB index and the total episodes as well as each phasic, tonic and mixed episodes ($p < 0.05$), with correlations ranging from moderate to strong ($r > 0.3$). When examining each episode, excluding mixed episodes, tonic episodes have the highest correlation. This result is consistent with Saczuk (2019), showing a moderate correlation between tonic bursts and SB index, indicating that the higher the tonic bursts, the higher SB index [12].

The average and maximum MVC percentage are 21.02 ± 13.86 and 137.69 ± 69.06 respectively (table 6). Results of Kato (2006) suggest that about 80% of subjects had bursts < 20% MVC [24]. According to Clarke (1984), the protective function of oral mechanoreceptors appears to be ignored during heavy clenching in sleep, making it possible to induce, thus the masseter muscle can function beyond the maximum voluntary clenching [25]. This explains the percentage of maximum bite force in our study exceeding > 100% of the subject's MVC performed while awake.

5. CONCLUSION AND RECOMMENDATIONS

In conditions where assessing nocturnal bruxism using PSG is still not widely available and has many limitations, based on the results of this study, we suggest that EMG Logger could be used as a simple and safe device to evaluate the activity of masseter muscles during sleep. In the future, it is expected that applications of the device will expanded to observation, evaluation and diagnosis of normal or abnormal gnathic functions, e.g., assessment of bruxism and observation of the chewing state in

daily life. Possible applications to examination of body muscles as well as masticatory muscles are also expected in the elds of rehabilitation medicine and sports medicine.

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HƯỚNG DẪN SỬ DỤNG MÁY EMG LOGGER

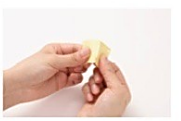
1 CHUẨN BỊ

Những vật dụng cần chuẩn bị: bút, phiếu ghi nhận, khăn (giấy) lau da, bông cồn (hoặc khăn giấy ướt), ...

◀ Mã QR Video hướng dẫn

☐ Dán miếng dán hai mặt chuyên dụng vào mặt sau thiết bị

Kiểm tra thẻ nhớ SD để đảm bảo thẻ đã được gắn sâu vào khe cắm thẻ ở bên thân máy đo.



Lột bỏ giấy vàng phía ngoài của tấm dán keo 2 mặt.

Dán tấm dán keo 2 mặt vào mặt sau của máy đo, ấn mạnh cho tấm dán bám chắc.

Lột bỏ miếng dán trong suốt bên ngoài, giữ lại lớp keo 2 mặt bên trong.

☐ Gạt nút nguồn của máy sang chế độ ON ở mặt bên thiết bị. Đèn báo ON hiện màu xanh lục (nếu thao tác chính xác thì đèn báo nhấp nháy mỗi 3s).
Lắp vỏ nhựa bảo vệ để hoàn tất bước chuẩn bị. Ghi nhận thời gian bật thiết bị vào phiếu ghi nhận.

** Nếu kẹt thẻ nhớ SD, đèn báo hiệu sẽ nhấp nháy liên tục*

** Nếu đèn báo không nhấp nháy hoặc nhấp nháy bất thường thì hãy báo lại với phòng khám.*

Gạt nút nguồn của máy sang chế độ ON ở mặt bên thiết bị.

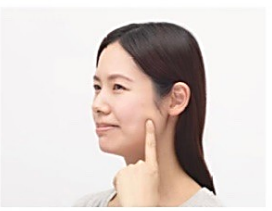
Đèn báo ON nằm mặt trước thiết bị. Đèn báo hiện màu xanh lục và quan sát.

Vỏ nhựa bảo vệ

Sau khi lắp vỏ nhựa bảo vệ

2 DÁN

☐ Xác định vị trí dán - Lau vùng da dán - Dán thiết bị



Dùng ngón tay xác định vị trí dán (vị trí cơ căng cứng khi cắn 2 hàm răng lại).

Lau sạch bã nhờn, lớp trang điểm ở vùng da chuẩn bị dán.

Dán thiết bị dọc theo chỗ phồng của cơ.

3 THAO TÁC

☐ Thực hiện 3 động tác cơ bản và ghi nhận thời điểm lúc thực hiện vào phiếu ghi nhận

Thực hiện theo thứ tự:
① Siết chặt hàm hết sức trong 3 giây
② Thực hiện động tác cắn 3 lần
③ Siết chặt hàm hết sức trong 3 giây

4 KẾT THÚC ĐO

☐ Ngay sau khi thức dậy, ghi nhận thời gian thức giấc vào phiếu.

** Nếu trong đêm có thức giấc đi vệ sinh, phải ghi nhận thời điểm đó vào phiếu theo dõi.*

☐ 1) Tháo máy đo.
☐ 2) Tắt nguồn máy: bật nút sang vị trí OFF.
☐ 3) Lột tấm dán keo 2 mặt ra khỏi thiết bị đo.
☐ 4) Lau nhẹ mặt sau máy đo bằng bông tẩm cồn, cất thiết bị và vỏ nhựa bảo vệ vào hộp.
☐ 5) Mang phiếu theo dõi và máy đo đến tái khám tại bệnh viện.

PHIẾU GHI NHẬN

Họ và tên bệnh nhân:

Mã bệnh nhân:

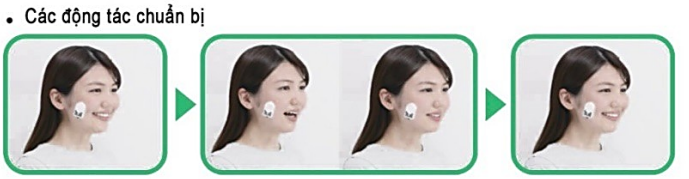
Ngày nhận	.....	Ngày trả	.....

Vị trí dán

Dán máy đo vào vị trí đánh dấu trên hình

** Không để máy đo bị dính nước hay va đập.*

- Các động tác chuẩn bị



Siết chặt hàm hết sức trong 3 giây | Thực hiện động tác cắn 3 lần | Siết chặt hàm hết sức trong 3 giây

Mã QR video hướng dẫn

ĐIỀN THỜI GIAN *(Vui lòng làm theo hướng dẫn của bác sĩ để biết số lần đo)*

	Ngày...tháng...năm	Thời điểm bật ON	Thời điểm thực hiện thao tác cơ bản	Thời điểm bật OFF
Ví dụ	Ngày 21 tháng 02 năm 2022	22 giờ 00 phút	22 giờ 00 phút	6 giờ 00 phút
1				
2				
3				

ĐIỀN THỜI GIAN THỰC HIỆN CÁC HOẠT ĐỘNG KHÁC NẾU BẠN THỨC DẬY TRONG LÚC NGỦ.
Ví dụ: đi vệ sinh, ...

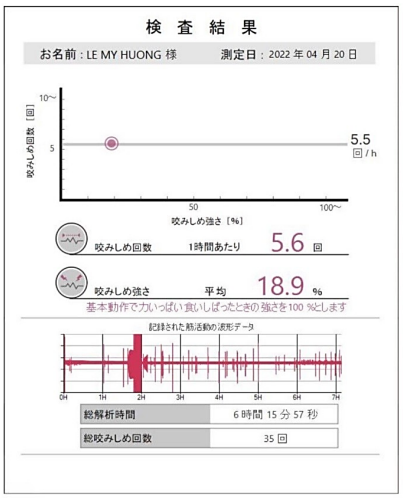
	Thời gian thức dậy	
1	Ngày ... tháng ... năm ...	... giờ ... phút
2		
3		

◆ *Nếu có thắc mắc, xin liên hệ trực tiếp với bác sĩ.*

EMG test results during sleep
x2 baseline

Pt. ID : 002 Name Le My Huong y / Female

Date: M 04 / D 20 / Y 2022



Determination of sleep bruxism

Negative・Positive (Mild / Moderate / Severe)

□ Total burst number: 197 /sleep
□ Burst number/h: 31.42 /h (Phasic: 25.68 /h, Tonic: 18.86 /h)
□ Total episode number: 35 /sleep (Phasic: 7 , Tonic: 5 , Mixed: 23)
□ Episode number/h: 5.58 /h
□ Mean MVC: 18.86 %MVC / Maximum MVC: 74.89 %MVC